CHEMISTRY QUESTION PAPER

Time : 2 Hrs. **Max. Marks : 40**

Q. 1. Select and write the most appropriate answer from the given alternatives for each sub-question : [8]

(i) The enthalpies of all elements in their standard states are ..... (1)
(a) less than zero (b) zero (c) unity (d) greater than unity

(ii) A conjugate acid-base pair differs by ..... (1)
(a) one electron (b) one neutron (c) one proton (d) one electron pair

(iii) The unit of electrochemical equivalent is ..... (1)
(a) gram (b) coulomb gram^{-1} (c) gram amp^{-1} (d) gram coulomb^{-1}

(iv) The minimum amount of fissionable material required to continue the chain reaction is called ..... (1)
(a) fission mass (b) critical mass (c) active mass (d) atomic mass

(v) In a zero order reaction, the rate of reaction is independent of ..... (1)
(a) concentration of products (b) catalyst
(c) concentration of reactants (d) temperature

(vi) The chemical formula of willemite is..... (1)
(a) ZnS (b) $ZnCO_3$ (c) ZnO (d) Zn_2SiO_4

(vii) The volume of water to be added 0.1 dm^3 of 0.5 N H_2SO_4 to get decinormal solution is ..... (1)
(a) 0.1 dm^3 (b) 0.4 dm^3 (c) 0.45 dm^3 (d) 0.5 dm^3

(viii) The enthalpy change for combustion of methane is – 890 kJ/mol. What is the amount of heat liberated on combustion of 8×10^{-3} kg of methane ? (1)
(Given : Atomic weights C = 12, H = 1)
(a) – 890 kJ (b) – 445 kJ (c) + 445 kJ (d) + 890 kJ

Q. 2 (A) Attempt any ONE : [8]

(i) Derive an expression for the effect of temperature on the heat of reaction at constant pressure.
(ii) Draw a neat labelled diagram of Berkeley & Hartley method to measure osmotic pressure. (2)

(B) Attempt any ONE :

(i) Define : (a) Solubility product (b) Corrosion. (2)
(ii) Distinguish between molecularity of reaction and order of reaction. (2)

(C) Answer the following :

(i) Explain the following characteristics of transition elements. (2)
(a) Tendency to form complexes. (b) Catalytic property.
(ii) Define osmotic pressure. Derive an equation for determination of molecular weight from osmotic pressure. (2)

Q. 3 (A) Answer any ONE : [8]

(i) Describe Landsberger and Walker method for determination of molecular weight from boiling point elevation. (3)
(ii) Define isotopes. Explain the use of radio-isotope in carbon dating. (3)

(B) Attempt any ONE :

(i) Derive an integrated rate equation for the first order reaction. (3)
(ii) What is the action of following on zinc metal ? (3)
(a) Concentrated HCl (b) Hot solution of NaOH (c) Ammonia.

(C) Answer the following :

(i) Define electrochemical series. Explain its 'one' application. (2)

Q. 4 (A) Answer the following : [8]

Define : (i) Enthalpy. (ii) Molar heat capacity at constant volume.
Show that $\Delta H = \Delta E + P \Delta V$, at constant pressure. (4)

(B) Attempt any ONE :

(i) Define hydrolysis of a salt. Show that, for the salt of weak acid-weak base salt, $K_h = \frac{K_w}{K_a \cdot K_b}$ (4)

(ii) Define single electrode potential. Explain Nernst theory of electronation and de-electronation with suitable example. (4)

Q. 5 (A) Attempt any ONE : [8]

(i) Calculate the heat of formation of sucrose from the following data :
(1) $C_{12}H_{22}O_{11(s)} + 12O_{2(g)} \rightarrow 12CO_{2(g)} + 11H_2O_{(l)}$; $\Delta H_1 = -5835.16$ kJ

(2) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$; $\Delta H_2 = -394.96$ kJ

(3) $H_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow H_2O_{(l)}$; $\Delta H_3 = -286.18$ kJ (4)

(ii) The pH of decimolar solution of NH_4Cl is 5.1276. Calculate K_h, h and K_b for same solution. (Given : $K_w = 1 \times 10^{-14}$) (4)

(B) Answer any TWO :

(i) Calculate mass defect and binding energy per nucleon of $^{59}_{27}Co$ if the isotopic mass of cobalt is 58.997 a.m.u.

Given : Mass of Proton = 1.0078 a.m.u.

Mass of neutron = 1.0086 a.m.u. (2)

(ii) Calculate the amount of electricity required to reduce all silver ions from 1 dm^3 of 0.25 M silver nitrate solution.(At. Wt. : Ag = 108, N = 14 and O = 16, 1F = 96500 C) (2)

(iii) 1×10^{-3} kg of non-volatile substance, when dissolved in 5.05×10^{-2} kg of benzene, freezing point of the solvent was lowered by 0.4 K. If the freezing point depression constant of benzene is 5.12 K. kg. mol^{-1}, calculate molecular mass of the solute. (2)